National Aeronautics and Space Administration

The Etching and Characterization of carbon nanofiber nanoelectrode arrays: For development of ultrasensitive biosensors

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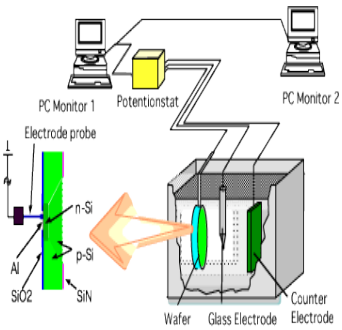
Abstract

The fabrication of patterned carbon nanofiber nanoelectrode arrays is a critical foundation in the synthesis of making biosenors. Biosenors are make from 4inx4in circular silicon wafers, which are diced into about 20 half inch electrode arrays. These arrays contain carbon nanofibers. During the fabrication process, the arrays are coated with a layer of Silicon dioxide which protects the carbon nanofibers that the arrays contain. The etch is the proces by which the silicon dioxide is removed from the nanofiber tips. Exposing the tips of the carbon nanowires is crucial for the biosensing detection.



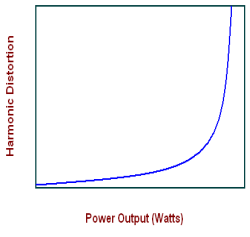
Introduction

Over time there has been an increase in the amount of pathogen in water, food, and other media including the human body; and new methods for detection are needed. These methods are fast, ultrasensitive, and portable. Electrochemical biosenors are capable of detecting a variable range of things like species, proteins, and viruses. Plus they are simple, portable and energy efficient.

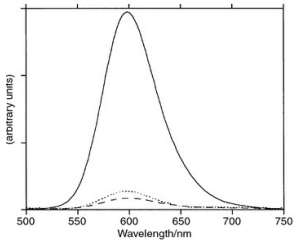
Methods and Materials

First a chip is selected for the wafer matrix, then soaked in acetone for 10 min. Following the soak the chip is washed with acetone then, placed in a small beaker with acetone and sonicated for 10 sec at level 5.The chip is then wash in order with $OC(CH_3)2$, CHOH, C_3H_7OH, and DI H_2O. The chip is soaked in 1M nitric acid for 30 min. Then the chip is etch for 30 sec for each array with 1M NaOH. After the etch the chip is soaked again in 1M nitric acid this time for 15 min. When the chip is finished soaking the characterization of the chip takes place, this shows the results of nanofibers on the chip following the etch. The characterization or, know as the DVP is use with $Ru(bpy)_3^{2+}$. If chip shows a good sigmoid curve then, the chip past to the next step for probe attachment(s).

Conclusions / Results



Standard Etch results



Standard Ru DPV results

References

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